

I claim:

1. A method for the preparation of H<sub>2</sub>O<sub>2</sub> wherein,  
H<sub>2</sub>O<sub>2</sub> is produced by a first reaction, electrolysis converting H<sub>2</sub>SO<sub>4</sub> into H<sub>2</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and then a second reaction, said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> formed in first reaction, is reacted with H<sub>2</sub>O in a second reaction to form H<sub>2</sub>O<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub> and wherein,  
at least one of: the separation of said H<sub>2</sub> from said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, the separation of said H<sub>2</sub> from a mixture of said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and said H<sub>2</sub>SO<sub>4</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> from said H<sub>2</sub>SO<sub>4</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> from said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> and water from said H<sub>2</sub>SO<sub>4</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> from a mixture of said H<sub>2</sub>SO<sub>4</sub> and said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, the separation of said H<sub>2</sub>SO<sub>4</sub> from said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and any combination therein is performed with a membrane.
2. The method of claim 1, wherein the first reaction does not go to completion and wherein,  
a mixture of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> is reacted with H<sub>2</sub>O in the second reaction.
3. The method of claim 1, wherein said membrane is constructed of organic materials.
4. The method of claim 1, wherein said membrane is constructed of inorganic materials.
5. The method of claim 1, wherein said H<sub>2</sub>SO<sub>4</sub> in the second reaction is recycled to the first reaction.
6. The method of claim 1, wherein said electrolysis is performed across an electrically charged conductive membrane.
7. The method of claim 1, wherein said electrolysis is performed with electrodes.

8. The method of claim 7, wherein said electrodes are made of at least one of: zirconium, hastelloy, ceramic and titanium.

9. The method of claim 1, wherein at least one of the separation processes is performed with distillation.

5 10. The method of claim 9, wherein said distillation separates H<sub>2</sub> from at least one of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

11. The method of claim 9, wherein said distillation separates H<sub>2</sub>O<sub>2</sub> from at least one of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

10 12. The method of claim 9, wherein said distillation separates H<sub>2</sub>O from at least one of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

13. The method of claim 1, wherein said second reaction contains an excess of said H<sub>2</sub>O, wherein an aqueous concentration of said H<sub>2</sub>O<sub>2</sub> is generated.

14. The method of claim 1, wherein H<sub>2</sub>O is added to said H<sub>2</sub>O<sub>2</sub> from said second reaction.

15 15. The method of claim 1, wherein there is no vehicular transportation of said H<sub>2</sub>O<sub>2</sub>.

16. The method of claim 1, wherein said H<sub>2</sub> produced in the first reaction is utilized in a fuel cell to generate electricity.

17. The method of claim 16, wherein at least a portion of said electricity is used for the electrolytic conversion of H<sub>2</sub>SO<sub>4</sub> into H<sub>2</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

20 18. A process of H<sub>2</sub>O<sub>2</sub> production wherein, H<sub>2</sub>O<sub>2</sub> is produced by a first reaction, electrolysis converting H<sub>2</sub>SO<sub>4</sub> into H<sub>2</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and then a second reaction, said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> formed in first reaction, is reacted with H<sub>2</sub>O in a second reaction to form H<sub>2</sub>O<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub> and wherein,

at least one of: the separation of said H<sub>2</sub> from said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, the separation of said H<sub>2</sub> from a mixture of said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and said H<sub>2</sub>SO<sub>4</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> from said H<sub>2</sub>SO<sub>4</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> from said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> and water from said H<sub>2</sub>SO<sub>4</sub>, the separation of said H<sub>2</sub>O<sub>2</sub> from a mixture of said H<sub>2</sub>SO<sub>4</sub> and said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, the separation of said H<sub>2</sub>SO<sub>4</sub> from said H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> and any combination therein is performed with a

5 membrane.

19. The process of claim 18, wherein the first reaction does not go to completion and wherein,

a mixture of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> is reacted with H<sub>2</sub>O in the second reaction.

10 20. The process of claim 18, wherein said membrane is constructed of organic materials.

21. The process of claim 18, wherein said membrane is constructed of inorganic materials.

22. The process of claim 18, wherein said H<sub>2</sub>SO<sub>4</sub> in the second reaction is recycled to

15 the first reaction.

23. The process of claim 18, wherein said electrolysis is performed across an electrically charged conductive membrane.

24. The process of claim 18, wherein said electrolysis is performed with electrodes.

25. The process of claim 24, wherein said electrodes are made of at least one of:

20 zirconium, hastelloy, ceramic and titanium.

26. The process of claim 18, wherein at least one of the separation processes is performed with distillation.

27. The process of claim 26, wherein said distillation separates H<sub>2</sub> from at least one of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

28. The process of claim 26, wherein said distillation separates H<sub>2</sub>O<sub>2</sub> from at least one of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

5 29. The process of claim 26, wherein said distillation separates H<sub>2</sub>O from at least one of H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.

30. The method of claim 18, wherein said second reaction contains an excess of said H<sub>2</sub>O, wherein an aqueous concentration of said H<sub>2</sub>O<sub>2</sub> is generated.

10 31. The process of claim 18, wherein H<sub>2</sub>O is added to said H<sub>2</sub>O<sub>2</sub> from said second reaction.

32. The process of claim 18, wherein there is no vehicular transportation of said H<sub>2</sub>O<sub>2</sub>.

33. The process of claim 18, wherein said H<sub>2</sub> produced in the first reaction is utilized in a fuel cell to generate electricity.

15 34. The process of claim 33, wherein at least a portion of said electricity is used for the electrolytic conversion of H<sub>2</sub>SO<sub>4</sub> into H<sub>2</sub> and H<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.